

REMARKS

Claims 1-54 are pending in this application.

Because of the grammatical errors and English language idiosyncracies in the original specification, the applicants have voluntarily provided a substitute specification (and a marked-up original specification) correcting the errors. The applicants request that the Examiner accept the substitute specification as it is now in better U.S. form. No new matter has been introduced by amendment.

Claims 1-54 stand rejected under 35 U.S.C. §112 as being indefinite. The amendments to claims 1, 10 and 45 are supported in the original specification on page 10, lines 4-7; page 16, lines 24 to page 17, line 7; and page 33, lines 17-19. The remaining amendments correct formal matters. No new matter has been introduced.

A thermal acoustic insulation material set forth in claim 1 of applicants' invention is a wool-like aggregate in which carbon fibers are bonded to each other at contact points by a thermosetting resin. The carbon fibers are non-galvanic corrosive and the resultant aggregate is also non-galvanic corrosive.

Claim 1 stands rejected under 35 U.S.C. §102(b) as being anticipated by **McCullough, Jr. et al.** Claims 2-54 stand rejected under 35 U.S.C. §102(b) or 35 U.S.C. §103(a) as obvious over **McCullough, Jr. et al.**

McCullough, Jr. et al., discloses a fire retarding, radiation and fire shielding structural panel, comprising at least one compressed composite composed of a thermoplastic or

thermosetting resin matrix containing about 10 to 95% by weight of non-flammable non-graphitic carbonaceous non-linear fibers having an L.O.I. value of greater than 40 (*see* claim 1).

The primary differences between applicants' invention and **McCullough, Jr. et al.** are the following:

1. Applicants' invention uses carbon fibers having a non-galvanic corrosive property, making the thermal-acoustic insulation material *per se* non-galvanic corrosive. Besides the fact that **McCullough, Jr. et al.** does not disclose a structural panel that is non-galvanic corrosive, **McCullough, Jr. et al.** describes using "non-electrically conductive carbonaceous fibers" and carbonaceous fibers having "no anti-static characteristics" (col. 4, lines 48-60) as one type of fiber for the invention. Technically, non-galvanic corrosiveness is disclosed as being *specified by galvanic currents*, and therefore inherently differs from such "non-electrically conductive" and "no anti-static" characteristics as in **McCullough, Jr. et al.**

For example, Fig. 12 in the present application shows an apparatus used for measuring galvanic currents. The lead wires 6 are provided so that the zero-shunt ammeter 7 can detect an electromotive force (EMF) generated between the electrodes 1 and 2, and the lead wires 6 are not for the purpose of supplying electricity to the carbon fiber aggregate electrode 1. As will be understood, the galvanic currents measured with this apparatus are not the electrical

conductivity of the carbon fiber aggregate but the EMF generated *between* the electrode made of the carbon fiber aggregate and the electrode made of aluminum alloy.

It is also noted that the intensity of the EMF is closely related to ionization tendency of a material constituting the electrodes, *but not directly related to the electrical conductivity of the material*. The thermal-acoustic insulation material of the claimed invention, specifically, the thermal-acoustic insulation material having a galvanic current of 10 μm (claim 2) or lower is unobvious over **McCullough, Jr. et al.**

2. The thermal-acoustic insulation material of the claimed invention is a wool-like aggregate of carbon fibers in which the carbon fibers are bonded to each other by a thermosetting resin at the contact points thereof. In order to realize such an aggregate of carbon fibers, it is necessary to appropriately adjust the amount of the thermosetting resin and the conditions of spraying the thermosetting resin. This is described on page 33, lines 1-20; page 34, line 19 to page 35, line 4; and page 35, line 24 to page 36, line 5 in the original specification. In particular, it is clearly stated on page 36, lines 1-5 that:

It is not preferable if the value exceeds 40 wt. % because the portions of the fibers except the contact points will be bonded due to the excessive amount of the binder. On the other and, if the value is less than 10 wt. %, the contact points will be sufficiently bonded and thereby resulting too small tensile strengths and compression recovery rates.

As can be seen from this description, it is required that the amount of the thermosetting resin be in the range of 10 to 40 wt. %, and the amount of the carbon fibers be correspondingly 90 to 60 wt. %.

By contrast, the structural panel of **McCullough, Jr. et al.** contains "10 to 95% by weight ... carbonaceous fibers" (col. 2, lines 35-37 and lines 43-44 and claim 1). This suggests the use of correspondingly 5 to 90% by weight of a resin (thermoplastic resin or thermosetting resin). In other words, the structural panel of **McCullough, Jr. et al.** has an amount of resin more than the amount of fibers (*i.e.*, the amount of resin is 50% or more), and can have an amount of resin of 90%. The structural panel having 90% resin means that a very small amount (10%) of carbon fibers are dispersed in a resin matrix, and naturally, in the resin matrix, almost the entire surface of each of the carbon fibers is bonded by the resin. Accordingly, it is concluded that **McCullough, Jr. et al.** does not teach or suggest a wool-like aggregate of carbon fibers being bonded at a contact point thereof.

It is further noted that when a thermosetting resin is excessively used as a binder, a carbon fiber aggregate having a small bulk density of 3 kg/m³ to 10 kg/m³ (as in claim 3 of the present application) cannot be obtained, nor can a carbon fiber aggregate that can satisfy claim 7 or 8 be obtained.

Claims 45-54 are unobvious over McCullough, Jr. et al.

McCullough, Jr. et al. does not teach or suggest the idea of forming a non-galvanic corrosive thermal-acoustic insulation material by using non-galvanic corrosive carbon fibers. In addition, McCullough, Jr. et al. does not teach or suggest the idea of forming a wool-like aggregate of non-galvanic corrosive carbon fibers being bonded together at the contact points thereof. Hence, the thermal-acoustic insulation materials as set forth in claims 45-54 are unobvious over McCullough, Jr. et al.

Claims 10-44 are unobvious over McCullough, Jr. et al.

Claims 10-44 are based on the result of the experiment demonstrating that a carbonizing temperature of carbon fibers is closely related with a tensile strength (see Figs. 2-3), and that the relationship between the carbonizing temperature and the tensile strength greatly varies depending on materials for the carbon fibers (*i.e.*, either anisotropic pitch or isotropic pitch). Described below are the differences between claim 10 of the present invention and McCullough, Jr. et al.

Claim 10 of the present application is as follows:

10. A method of manufacturing a thermal-acoustic insulation material, comprising the steps of:
 - a spinning step of producing spun fibers by heating and melting anisotropic pitch obtained by polymerizing condensed polycyclic hydrocarbon, then discharging a melted matter out of a spinning nozzle and at the same time, blowing a heated gas

from around the spinning nozzle in the same direction to which the melted matter is discharged; (*hereinafter "step (a)"*)

a carbon fiber manufacturing step of manufacturing non-galvanic-corrosive carbon fibers having non-sinusoidal and non-coil-like configuration by infusibilizing spun fibers and thereafter carbonizing the fibers at not lower than 550°C, but lower than 800°C; (*hereinafter "step (b)"*)

a spraying and accumulating step of accumulating said non-galvanic-corrosive carbon fibers onto a plane so as to form a wool-like material, while spraying a thermosetting resin solution to said fibers; and (*hereinafter "step (c)"*)

a heat-forming step of forming said wool-like material of accumulated carbon fibers by applying heat so that contact points of said carbon fibers are bonded. (*hereinafter "step (d)"*)

(1) In step (a) above, a melt-blown type method in which a heated gas is blown in the same direction as the direction to which the melted matter is discharged is employed, whereas **McCullough, Jr. et al.** does not contain description of such a method.

(2) In step (b) above, the fibers are carbonized at a temperature in the range of 550°C to lower than 800°C to produce non-galvanic-corrosive carbon fibers, whereas **McCullough, Jr. et al.** does not describe such a carbonization treatment.

(3) It is vital in steps (a) and (b) that the anisotropic pitch obtained by polymerizing condensed polycyclic hydrocarbon be used as a material for carbon fibers and the temperature of carbonizing be from 550°C to lower than 800°C, in order to produce non-galvanic-corrosive carbon fibers. This combination is not disclosed in **McCullough, Jr. et al.** This combination is particularly important in the claimed invention since these conditions produce a thermal-acoustic insulation material excellent in mechanical strength, durability, thermal

insulating quality, acoustic absorptivity, and non-galvanic corrosiveness. The technical significance of these conditions is described on page 13, lines 17-20; page 15, line 20 to page 16, line 19; and in Figs. 1-5 in the original specification. Furthermore, the carbonaceous fibers in **McCullough, Jr. et al.** are derived from acrylic fibers, which is also different from applicant's invention.

(4) By step (b) above, carbon fibers having non-sinusoidal and non-coil-like configuration are produced, and in the subsequent steps. the carbon fibers having non-sinusoidal and non-coil-like configuration are used for producing a thermal-acoustic insulation material. By contrast, carbonaceous fibers in **McCullough, Jr. et al.** "possess sinusoidal or coil-like configuration" (col. 2, lines 40-41).

Figs. 1(a) and 1(b) (enclosed) showing photomicrographs of the carbon fiber aggregate of the claimed invention, in which the carbon fibers have a *non-sinusoidal* and *non-coil-like configuration*. From these figures, it will be readily appreciated that the carbon fibers constituting the thermal-acoustic insulation material of the claimed invention have different shapes from the carbon fibers constituting the structural panel of **McCullough, Jr. et al.**

(5) In step (c) above, non-galvanic-corrosive carbon fibers are accumulated onto a plane while thermosetting resin solution is being splayed, which is again not disclosed in **McCullough, Jr. et al.**

(6) In step (d) above, contact points of the carbon fibers are bonded to each other by heating the accumulated material, whereas the idea of bonding contact points of fibers is not taught or suggested in **McCullough, Jr. et al.**

Claimed elements (a) to (d) in claim 10 of the present application are not taught or suggested in **McCullough, Jr. et al.**, nor can these elements be reached from **McCullough, Jr. et al.** Hence, claim 10 and claims dependent thereon are unobvious over **McCullough, Jr. et al.**

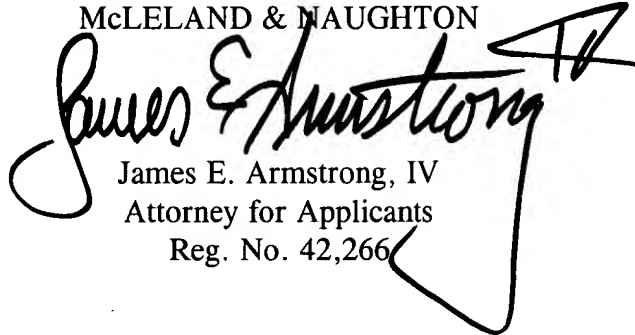
If, for any reason, it is believed that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

Amendment Under 37 CFR §1.111
July 26, 2000

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In the event that this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. The fees for such an extension or any other fees which may be due with respect to this paper, may be charged to Deposit Account No. 01-2340.

Respectfully submitted,
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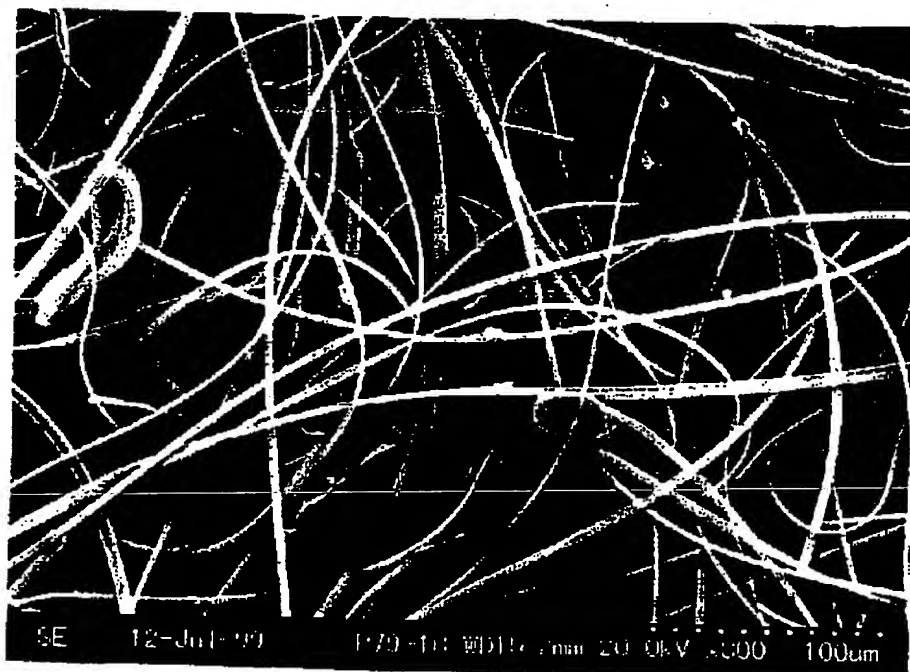
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Enclosure: Reference Figs. 1(a) and 1(b)
Substitute Specification
Marked-up Original Specification

Ref. Fig.1(a)



Ref. Fig.1(b)



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